# Development of the research lifecycle model for library services

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**Question:** Can the niche services of individual librarians across multiple libraries be developed into a suite of standard services available to all scientists that support the entire research lifecycle?

**Setting:** Services at a large, research-intensive state university campus are described.

**Method:** Initial data were collected via concept mapping by librarians. Additional data were collected at conferences and meetings through interactive poster presentations.

**Main Results:** Services of interest to scientists for each of the stages in the research lifecycle were developed by the team to reflect the wide range of strengths of team members in aggregate.

**Conclusion:** Input from researchers was the most effective tool for developing the model. A flexible research lifecycle model can be developed to match the needs of different service groups and the skills of different librarians.

## STATEMENT OF THE CASE

In the summer of 2011, a group of five librarians from the University of North Carolina at Chapel Hill (UNC-CH) Health Sciences and Kenan Science Libraries formed a team to discuss library services and methods of service delivery to the sciences. Each member of the team provided a varying suite of services tailored to their constituencies. Because these special services could be of value to all researchers, the team wanted to determine whether niche services of individual subject librarians working in two different libraries could be developed into a suite of standard services available to all scientists and clinicians across the university and throughout the research lifecycle and to determine which were most important to them. The team tackled these questions with a multifaceted approach that ultimately led to the development of a new service model based on the research lifecycle.

## SETTING

The health and life sciences team in the UNC-CH Libraries is composed of five librarians and several graduate students in library science. UNC-CH is a large research-intensive state university campus, whose facilities include a large health sciences library, a natural sciences library, a Clinical and Translational Sciences Award unit, and a large, interdisciplinary genomics center.

## METHODS

The team approached the question of which library services should become part of a standard suite offered to researchers in five phases: a literature review, development of a concept map to identify current and potential library services, gathering of data in interactive poster sessions, establishment of a pilot study population, and development and testing of the model.

### Stage 1: literature review

The team conducted a review of library literature to identify possible new and emerging roles for librarians in assisting researchers. Several articles concluded that, based on surveys and interviews with researchers, three new areas of information management and support were in demand by or at least of interest to researchers. These were the identification of grants and other funding [1], identification of potential research collaborators [1, 2], and data management and retrieval [1–4]. These activities are not traditionally perceived as the domain of libraries.

Several papers issued a call for ''enhancing [librarians'] visibility'' [5] among researchers. Haglund and Olsson found that while researchers had a poor understanding of librarians' abilities, they were open to partnerships, leading to a conclusion ''that the librarians need to be present in the research environment for them to be engaged by the researchers'' [6].

The question of how to effectively raise the library's visibility was addressed in several papers. Healy reported on techniques used by the Wayne State Universities, including partnering with institutional review boards, the university technology transfer office, and graduate student and postdoctoral researcher organizations [5]. Johnson described a significant push at the University of Minnesota to focus on data services and research networking systems for biomedical scientists [2]. Responsibility for these new services was provided, in part, by hiring several new librarians specifically focused on research services, metadata, and digital materials and preservation.

Much of the literature examining new roles for libraries, and in particular library liaisons, describes an area in which a particular library has developed a new program. These programs include activities such as data curation and management [7], open access and scholarly communication [8, 9], and outreach via office hours [10], web conferencing [11], or

membership in subject societies [12]. There are also papers discussing the use of nonlibrarians as liaisons, including students [13] and library staff [14]. Each of these ideas has been evaluated and/or piloted by the UNC-CH Health Sciences Library in the past.

### Stage 2: identification of current and potential library services

To discover niche services currently provided by subject librarians in the campus libraries, the team used concept mapping. Concept mapping is a technique that is used to create qualitative pictures of concepts that might be overlooked in more structured information-gathering techniques, such as surveys or focus groups [15]. In the spring of 2012, forty-four subject librarians participated in a concept mapping exercise in which they were asked to quickly brainstorm user-oriented services that they provide on a regular basis (''often''), provide on an occasional or rare basis (''sometimes''), or would provide if they had both the demand and the resources (''potentially''). To develop a science-specific service model, only the nine maps that were generated by health and natural sciences librarians were analyzed. The remaining maps are useful for other studies involving the humanities, social sciences, and general library services.

The librarians' maps varied in format, from hand-drawn clusters linked with lines and arrows to typed lists in hierarchical outline format, and focused on public services that are provided ''often,'' ''sometimes,'' and ''potentially,'' as described above. The distinction between ''often'' and ''sometimes'' was left to the individual librarian's interpretation. For the purposes of the initial analysis, these two categories were combined into a broader group, ''current'' services, to contrast with potential services.

The science and health sciences librarians listed eighty-four services, of which fifty-seven were ''current,'' seven were ''potential,'' and twenty-seven were both ''current'' and ''potential.'' ''Current'' services included traditional librarian activities such as reference questions, courses, and consultations as well as less traditional activities such as moderating online courses and reviewing CVs for faculty undergoing tenure review. Most of the ''potential'' activities were already being performed by one or more librarians, including providing grant matching and discovery services and holding open office hours. The seven unique ''potential'' services were generally categorized into outreach (to new departments, to clinical units, and via social media), technology support (digitization projects, e-portfolio support, and usability studies), and scholarly communication (institutional repository projects). The eighty-four services identified in the maps were organized into eleven general topic categories, including reference, consultations, research support, and faculty activities. The services in the consultations category are presented in Table 1.

**Table 1**
Consultations category

| Consultations |
|---|
| Scheduled consultations |
| • Open office hours |
| • Search process |
| • Specific databases (PubMed, CINAHL, Web of Science) |
| • Citation management |
| – Citation styles (American Psychological Association) |
| – Specific programs |
| • Technology/tools |
| • Special topics |
| – Scholarly communication |
| – Data management |
| – Systematic reviews |

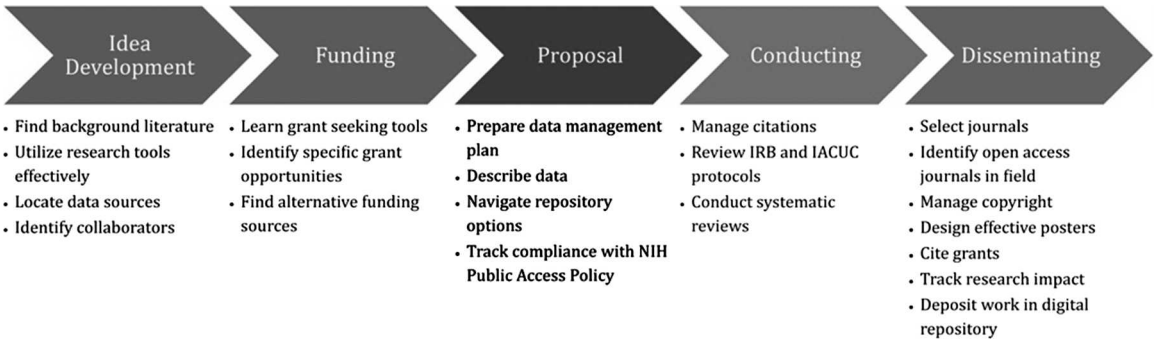
### Stage 3: interactive poster sessions

The completed, categorized list of services identified in the maps was presented at the 2012 annual meeting of the American Association of Colleges of Pharmacy (AACP) as an interactive poster [16]. This and subsequent interactive poster sessions allowed the team to understand which new services were of most interest to both researchers and librarians. Faculty and librarians were asked to mark on the poster which services they have or would like to receive (faculty) or currently provide or would potentially provide (librarians). They were also asked to suggest additional services.

Fourteen faculty and fourteen librarians volunteered to participate in data collection. Traditional librarian roles in reference, teaching, consultations, and outreach to students and faculty were the most popular currently provided services that both faculty and librarians marked. Both groups also agreed on potential new service areas: data management, grant matching, support for student research, and support for e-portfolios. The scholarly communication category had the largest overlap of services currently provided or used and services of potential interest to both groups, particularly in the areas of poster design and review and of support for legal issues such as copyright, open access, and the National Institutes of Health (NIH) public access policy. Five additional services were suggested, including support for electronic health records, consultations via Skype, and after-hours access to the library.

Poster feedback came from both the twenty-eight participants and others who commented on the poster. First, it was evident that library jargon made it difficult for faculty to evaluate services. Second, services, such as ''data management'' were duplicated across general topic categories, such as teaching and research support. Duplication was intended to imply different activities in the data management support environment but resulted in confusion about what the term meant for the study. Third, respondents were confused by the distinction between current and potential services. A fourth observation, however, was most interesting: faculty respondents expressed surprise that librarians could and would provide

**Figure 1**
Library services across the research lifecycle




several of the listed services, particularly those classified as research support and scholarly communication. Based in part on feedback from the AACP meeting, presentation of the services was reorganized for a second interactive poster at the Mid-Atlantic Chapter of the Medical Library Association meeting in the fall of 2012 [17].

### Stage 4: establishment of the pilot population

In 2012, UNC-CH opened an interdisciplinary facility to house researchers from several departments in the College of Arts and Sciences and the School of Medicine. A primary occupant of the new facility is the Carolina Center for Genome Science (CCGS), an interdisciplinary center that has been the locus of genomic research support at UNC-CH since 2001 and with which the Health Sciences Library has been affiliated for much of that time. In preparation for the opening of the new interdisciplinary Genome Science Building (GSB), the health and life sciences team met with the director and assistant director of the CCGS on several occasions in 2012 and presented a list of current and potential services targeted to researchers that was derived from the comprehensive set of eighty-four services presented on the previous posters.

Feedback from these meetings was positive, especially in regard to services the team could provide to the assistant director in the areas of grant funding and impact measurement. However, both directors noted that the list of current and potential services was too long, too library oriented, and generally not targeted toward the immediate and particular needs of researchers at the graduate student and faculty level. They recommended further development of the services list so that it would more closely relate to the questions that researchers have that librarians could address. Establishing researchers at the CCGS as a pilot population for developing a new service model allowed the team to focus on one specific group of interdisciplinary scientists with established relationships with the libraries.

At the same time that the libraries were discussing services with the CCGS, the Translational and Clinical Sciences (TraCS) Institute asked for a rubric that would illustrate where librarians provide support in the research lifecycle. The framework provided to the TraCS Institute became the basis for presenting library services identified in the concept maps in a researcher-centered manner.

### Stage 5: development and testing of the research lifecycle model

The request from the TraCS Institute in conjunction with the suggestions from CCGS allowed the team to combine the efforts of the two projects into a draft services model. The list of eighty-four services was condensed to twenty-two, each assigned to one of the five steps in the research lifecycle. The final version is presented in Figure 1. The draft model was presented to several groups.

The initial model was presented to the Health Sciences Library's Advisory Committee in early October 2012. Committee members were asked to check services that they would use or have used and to propose additions. The eleven committee members all participated; however, not all may be classified as researchers. Services in each of the five steps of the research lifecycle were of interest to this group. The most popular were:

- Find background literature (9 checkmarks)
- Find data sources (8)
- Identify specific grant opportunities (7)
- Find alternative funding sources (7)
- Manage citations (7)

Only two services received no checkmarks; these were ''Identify open access (OA) journals in field'' and ''Deposit work in Carolina Digital Repository.'' As noted above, much of the feedback about the poster had centered on the jargon included in some of the services, such as ''OA.'' Suggested services from committee members included ''find principal investigators (PIs) for students,'' ''tools for data analysis—buying subscriptions,'' and ''web casting symposia and seminars on campus.''

The updated poster was presented at the CCGS/GSB symposium in October 2012 [18]. Twelve graduate students and faculty members participated. The most popular services were:

- Identify specific grant opportunities (8 checkmarks)
- Find alternative funding sources (5)
- Learn grant-seeking tools (4)
- Find background literature (3)
- Navigate repository options (3)
- Track compliance with NIH public access policy (3)

Nine additional services were suggested, of which ''Tools for data analysis (i.e., buying subscriptions)'' received three additional checkmarks. The suggested services also included support for and/or subscriptions to other types of software, patent searching, text mining, webcasting of symposia and seminars on campus, and help with advanced literature retrieval.

As with the AACP poster, several students and faculty commented that they did not realize that the library could help with their research after the idea generation stage. Services in the second half of the research lifecycle (conducting and disseminating research) were less popular than those in the idea generating, funding, and proposing stages. Faculty did not check services for reviewing institutional review board (IRB) and institutional animal care and use committee (IACUC) protocols, designing effective posters, citing grants, and tracking research impact. However, these four services were already standard components of the libraries' services suite and historically are in high demand by research administrators, especially with the university IACUC, the TraCS Institute, and the CCGS itself.

## MAIN RESULTS

The research lifecycle model for library services to scientists is now in use by the health and life sciences team at UNC-CH. The model can be split into two components: the graphic and practical applications. The graphic is a marketing tool for library services, a tool for strategic planning for the libraries, and the unofficial logo for the team. It concisely relates library services to the five standard stages of research with which researchers are familiar.

In practice, the model demonstrates that the library provides services that fit along a continuum. In this case, the continuum is the research lifecycle as it is understood at UNC-CH. The services offered are user centered: they are presented in terms that users can relate to and understand. In addition, their utility has been confirmed by users, either through interactive poster sessions or in practice.

All services listed in the research lifecycle model can be performed by at least one librarian on the health and life sciences team, and many can be provided by a majority of team members. This enables the team to provide a large number of niche services to a wide group of researchers in a scalable fashion, given a limited number of liaisons.

The data collected from the interactive poster sessions suggest that scientists and administrators are familiar with services offered at the beginning and end of the research process. They were surprised to learn that librarians can provide support throughout the entire research lifecycle. The model allows the library to cultivate and promote services not just at the idea generation and dissemination stages, but also at the middle three stages of the research lifecycle. By basing the service model on the research lifecycle, the library is then poised to be a partner through the entire process, not just at the bookends of research.

The model is flexible in several ways. First, while the model will always reflect the stages of the research lifecycle, the services under each stage can be customized to fit user needs. Second, while the services are discipline dependent (a researcher in the humanities would need a different suite of services), the model as a whole is role independent. There are lifecycle services that apply to faculty, staff, students, researchers, administrators, and teachers in varying degrees. This enables flexible response by librarians to multiple constituencies. Finally, while the research lifecycle presented here is based on the health and life sciences, the model is eminently mutable and can be adapted to research, teaching, or practice in any number of disciplines. This particular benefit is demonstrated at UNC-CH: library leadership became very excited about creating an ''education continuum'' for library instruction and outreach services inspired by the research lifecycle model presented here. Additionally, the research lifecycle is one of three major initiatives included in the overarching university libraries strategic plan for 2013 to 2018.

## CONCLUSION

Outreach to researchers continues to be the most important piece of developing the model. From the data collection, it is clear that researchers simply do not know the scope of what librarians can do for them. The team is marketing research lifecycle services on the CCGS website, on posters around the GSB highlighting the research lifecycle graphic, and through visibility at conferences, meetings, and office hours. While uptake of research lifecycle services is only beginning to grow, this model has garnered significant support from key constituencies like the CCGS and has strengthened team librarians' collaborative working relationships with scientists at UNC-CH.

The data collected throughout the development of the research lifecycle model have led the health and life sciences team to further develop services across the lifecycle. Librarians on the team had already been helping scientists find background literature and utilize research tools effectively. There is now also an emphasis on finding grant funding and data management services among team members. All of the services offered by the team have been evaluated or piloted by librarians on campus. The distributed team model allows these services to be scaled up to a larger number of researchers than those in any given subject area.

The advantage of the research lifecycle model is that it is flexible enough to change with the needs of the service group and the skills of the librarians. As

popular needs change across the user group, services can be cycled in and out of the model. The advantage of the new model is that the framework does not have to change as the services change. Services offered by other institutions using this model may be different from those offered at UNC-CH, given differences in institutional cultures, needs, and resources.

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